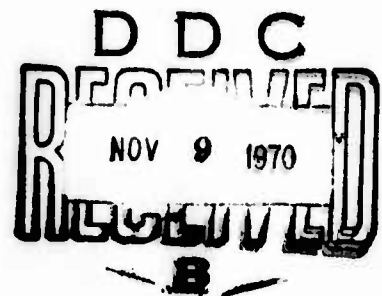


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# HumRRRO



Research By-Product

CRITICAL COMBAT PERFORMANCES,  
KNOWLEDGES, AND SKILLS REQUIRED OF THE  
INFANTRY RIFLE SQUAD LEADER

Machinegun, 7.62-mm, M60

by

Frank L. Brown

August 1969



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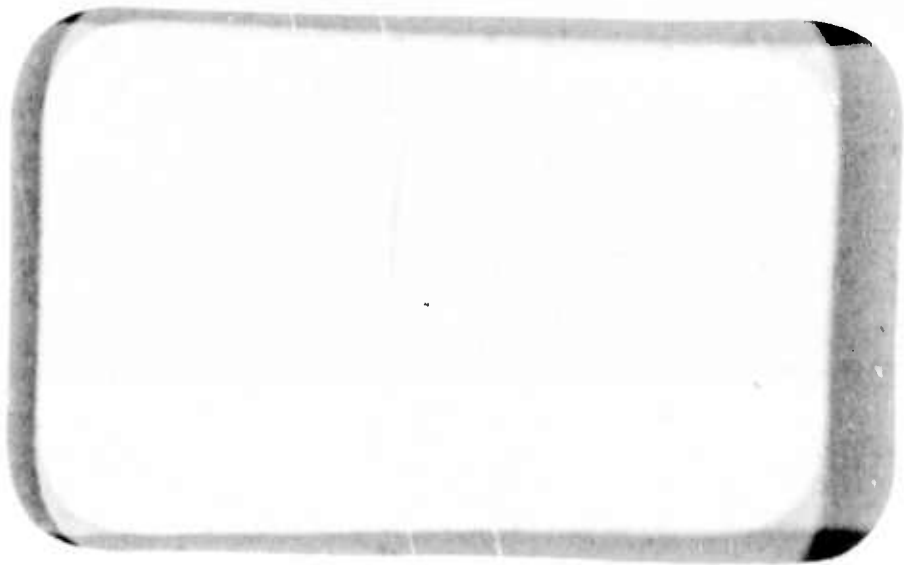
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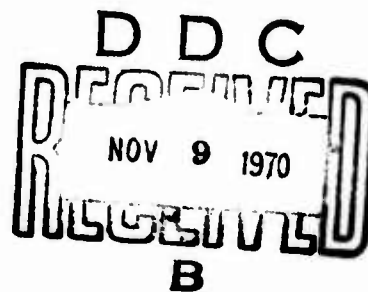
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HumRRO Division No. 4  
(Infantry)

The George Washington University  
HUMAN RESOURCES RESEARCH OFFICE  
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## FOREWORD

In response to a request from the United States Army Infantry School (USAIS), HumRRO Division No. 4 (Infantry) initiated a Technical Advisory Service research project to identify and record the critical combat performances, knowledges, and skills required of the Infantry Rifle Squad Leader (IRSL) and the Infantry Fire Team Leader (IFTL).

The requirements imposed upon the IRSL and IFTL are essentially the same, except that the former is responsible for the control of the men and fires of both fire teams in a rifle squad, rather than only one. The senior IFTL within each squad must be prepared to assume effective leadership of the squad immediately if the IRSL becomes a casualty, completes a prescribed combat tour, or is absent for any reason. Since it is common practice to provide the same training for candidates for both positions of leadership and to employ the outstanding candidates in the higher position, each paper in this series will set forth the critical requirements imposed upon the IRSL and, therein, those imposed upon the IFTL as well.

Under Work Unit LEAD, Work Sub-Unit I, the critical combat performances, knowledges, and skills of the Infantry Rifle Platoon Leader were published in a series of 41 papers covering a like number of subject areas. Each paper was published with prior review and concurrence by the USAIS Instructional Departments concerned. These papers are being used as the primary source of data in completing a parallel series of papers for the Infantry Rifle Squad Leader and the Infantry Fire Team Leader. This document details the requirements pertaining to the machinegun, 7.62-mm, M60.

This Technical Advisory Service research is being performed at HumRRO Division No. 4 (Infantry), Fort Benning, Georgia. The present Director of Research is Dr. T. O. Jacobs.

Military support for the study is being provided by the U.S. Army Infantry Human Research Unit, Fort Benning, Georgia. LTC Chester I. Christie, Jr. is the present Unit Chief.

HumRRO research is conducted under Army Contract DAHC 19-69-C-0018 and under Army Project 2Q062107A712, Training, Motivation, and Leadership Research.

Meredith P. Crawford  
Director  
Human Resources Research Office

## MACHINEGUN, 7.62-MM, M60

### General Considerations

#### Introduction

The machinegun, 7.62-mm, M60, is an air-cooled, belt-fed, gas-operated, automatic weapon designed specifically to support the rifleman in both offensive and defensive operations. This machinegun can engage distant targets with a heavy volume of controlled and accurate fire that exceeds the capability of lighter individual weapons. It provides the rifleman with a heavy volume of close and continuous fire support necessary to accomplish his mission in the attack. The long range, close defensive, and final protective fires delivered by this weapon form an integral part of the Infantry small unit's defensive fires.

Two M60 machineguns are organic to each rifle platoon in all Infantry companies. As the primary sources of small arms fire support for the rifle squads, these two guns will be placed in support of or attached to the rifle squads by the Infantry Rifle Platoon Leader (IRPL) when the rifle squads are operating as an integral part of the platoon. During semi-independent operations, such as night ambushes, an M60 machinegun frequently will be attached directly to the rifle squad for employment by the Infantry Rifle Squad Leader (IRSL). In mechanized units, the M60 machinegun is organic to the rifle squad and is manned by one or more squad members designated and trained by the IRSL. When an attached or organic M60 machinegun is employed with the rifle squad's base-of-fire element, the Infantry Fire Team Leader (IFTL) controlling the base of fire must control the machinegun effectively while the IRSL leads the squad's maneuver element. The IFTL may also be required to employ the machinegun in defensive positions and in ambush operations. Therefore, it is vital that both the IRSL and his IFTL's be capable of effectively employing and maintaining the machinegun and of training and supervising organic or attached machinegun crews.

#### Scope

This paper sets forth the knowledges, skills, and performances required of the IRSL (and his IFTL's) to employ and supervise the employment of the M60 machinegun organic or attached to the rifle squad. Inspection on initial issue; test firing and zeroing; selection of positions and the delivery of effective direct fire under all conditions of visibility; delivery of assault fire; engagement of aerial targets; delivery of overhead fire; delivery of fire from position defilade; maintenance of the gun, ammunition, and accessories; correction of malfunctions and the application of immediate action; the establishment of safety procedures; and destruction to prevent capture are covered in adequate detail. The IRSL is cast in the role of machinegunner for the purpose of this paper, and it is assumed that his mastery of the critical knowledges, skills, and performances will ensure the adequate training and supervision of crew members manning any M60

machinegun organic or attached to his squad. Target detection is covered in the IRSI paper on Observation, Combat Intelligence, and Reporting. The use of binoculars and night-vision sights to aid target acquisition and fire adjustment is covered in Use of Indirect Supporting Fires (binoculars) and Infrared Weaponsight and Image Intensification Devices. Additional directly related material is covered in the IRSI papers on Technique of Fire of the Rifle Squad; Physical Conditioning; Mounted and Dismounted Platoon Combat Formations; Cover, Concealment, and Camouflage; Offensive Operations; Defensive Operations; Retrograde Operations; and Patrolling.

## Materiel

Machinegun, 7.62-mm, M60, with attached bipod and sling.

Spare barrel, with attached bipod and case.

Ammunition, 7.62-mm belt, in bandoleers.

Mount, tripod, machinegun, M122, complete with traversing and elevating mechanism group and pintle assembly.

Cleaning rod, complete.

Brushes for cleaning chamber, bore, and receiver.

Ruptured cartridge extractor.

Asbestos mitten.

Combination wrench, screwdriver, and reamer.

Patches and cleaning rags.

Bore cleaner and lubricants specific to the environment.

Machinegun Record Book.

Locally procured canvas sleeves for protecting belted ammunition not carried in bandoleers.

Thin plastic sheeting for protecting gun against wind-driven dirt, water, etc.

White metal bands, white paint, or luminous tape for marking sights and stakes for limited visibility fire delivery.

Locally procured stakes, logs, boards, etc., for use to aid effective fire delivery during limited visibility.



### Battlefield Cues

Orders or instructions from commanders pertinent to the use or maintenance of the M60 machinegun.

Receipt of gun not known to have been zeroed properly or observation of bullet strike or failure to hit a target that indicates need to zero the gun and to use an adjusted aiming point pending zeroing.

Friendly troops or indigenous personnel known to be within the maximum range of the machinegun in the direction of fire, e.g., friendly troops in blocking positions.

Failure of a machinegun crew to displace as directed with accompanying threat of isolation of the gun and crew from the protection of local security.

Arrival of a machinegun at a defensive position when further contact is anticipated, i.e., need to position the gun immediately in a temporary position to cover the unit front pending emplacement in the primary position.

Relative usefulness of two or more possible positions for emplacing a machinegun to accomplish an assigned mission, i.e., visibility of target areas, terrain characteristics affecting delivery of fire, cover and concealment, etc.

Location of another machinegun in an adjacent squad sector which requires coordination of fires (with emphasis on coordination of final protective fires).

Close, dangerous targets requiring use of assault fire with a hand-carried machinegun or free gun with a tripod-mounted gun.

Gun-target distance requiring range estimation and sight adjustment prior to engagement.

Known or suspected enemy targets, e.g., automatic weapons positions, vulnerable surface vehicles and boats, and aircraft within effective range of the weapon.

Enemy troops in tactical formation with emphasis upon the shape, size, and angle of exposure with respect to the line of aim from the gun, i.e., linear targets, deep targets, linear targets with depth, and area targets, including apparent midpoint and flanks of each target.

Possible, but unidentified, targets, particularly when perceived during limited visibility, i.e., possibility of delivering lethal fire against unidentified friendly personnel or inadvertently disclosing the position of the gun by firing indiscriminately at enemy noises (e.g., thrown stones or sticks) generated to draw harmless fire and thus locate the gun position.

Enemy targets, terrain, and situation facilitating delivery of overhead fire or fire from position defilade in furtherance of the mission.

Availability of binoculars to aid target acquisition (and range estimation) during all levels of illumination, e.g., daylight, starlight, moonlight, artificial illumination.

Availability of night-vision sights to aid target acquisition and delivery of aimed fire when visibility is limited by natural darkness.

Easily identified reference points useful for target designation.

Threat of darkness, fog, snow, rain, or enemy use of smoke requiring the use of the tripod, range cards, and field expedients to ensure effective delivery of fire during limited visibility.

Orders or signals pertinent to fire control, i.e., to engage a designated target, adjust fires, regulate the rate of fire, shift fire, deliver final protective fire, cease fire, etc.

Exposure to harmful environments, such as mud, dust, rain, submersion (particularly in salt water), requiring cleaning prior to demand for delivery of fire.

Carbon build-up from prolonged firing requiring cleaning to ensure continued functioning.

Broken, worn, or missing parts discovered during inspection or routine maintenance.

Sluggish delivery of automatic fire, runaway gun, or other malfunction.

Failure of the machinegun to fire, extract, eject, cock, feed, or chamber, i.e., need for immediate action to reduce a stoppage.

Overheated barrel, i.e., failure to change barrels.

Dirty, corroded, or bent rounds of ammunition or ammunition exposed to a harmful environment.

Excessive dust and dirt in the air from wind, aircraft rotors, or propellers.

Freezing weather where heated bunkers or other warm shelters may cause moisture to condense on weapons brought in from cold outdoor temperatures with resultant freezing upon again being exposed to outside temperatures.

Accidental discharge of the weapon or unsafe handling by any soldier.

Failure of any gunner to deliver effective fire during enemy contact.



Failure to protect weapons from unnecessary wear and tear, e.g., piling weapons on trucks, helicopters, or APC without regard to probable damage to sights, traversing and elevating mechanisms, and other parts subject to damage.

Extended bipods around or within aircraft (likely to damage aircraft) or in heavy brush where the extended bipod will impede movement and slow weapons handling.

Any machinegun not carried in a firing position during movement when contact is anticipated.

Any machinegun on position and not manned when contact is anticipated.

Abandonment of tripod, ammunition, spare barrel, or any other accessories.

Imminent threat of capture of the M60 machinegun and accessories, including night-vision sights mounted on or used with the weapon.

1. UPON THE INITIAL ISSUE OR ATTACHMENT OF AN M60 MACHINEGUN AND COMPONENTS TO HIS SQUAD, THE IRSL WILL ENSURE THAT THE WEAPON IS COMPLETE, CLEAN, PROPERLY LUBRICATED, AND READY TO DELIVER FIRE.

He will : know that the M60 machinegun is organic to the mechanized rifle squad and may be attached to his squad (with or without a full crew) during operations with infantry, airborne, and airmobile rifle squads.

1

: unload and clear the gun upon receipt to ensure against a live round in the cartridge tray assembly or the chamber, i.e.:

2

- (1) Pull the bolt to the rear, place the safety on the "S" (safe) position, and return the cocking handle to the forward position. (Habitually return the cocking handle manually to its forward position each time the bolt is manually pulled to the rear.)
- (2) Raise the cover and remove any ammunition or links from the feedtray.
- (3) After the gun is unloaded, check the feedtray, receiver, and chamber visually or by feel during darkness to ensure that they are clear.
- (4) Place the safety on the "F" (fire) position, pull the trigger to allow the bolt to go forward, and return the safety to the "S" (safe) position.
- (5) Ensure that the weapon is kept unloaded and clear with the safety on the "S" (safe) position except when it is desired to load and fire the weapon or to check the mechanical functioning.

: ensure the availability of serviceable accessories and maintenance equipment, i.e., M122 tripod mount, including the tripod assembly, traversing and elevating mechanism, and the platform and pintle assembly; spare barrel case; spare barrel, with bipod assembly attached; asbestos mitten; ruptured cartridge extractor; bore brush; chamber brush; receiver brush; combination wrench; cleaning rod; patches and rags; lubricant prescribed for the climate; bore cleaner; and dry-cleaning solvent, if the latter is necessary to remove heavy grease, carbon, etc.

3

**He must :** systematically disassemble the M60 machinegun into the eight major groups and assemblies (general disassembly) without the use of force and with only a pointed object (to depress the stock latch when removing the stock group) and the combination wrench, i.e., disassemble to separate the machinegun into the following groups and assemblies:

4

- (1) Shoulder gun stock.
- (2) Buffer assembly and operating rod assembly groups.
- (3) Trigger mechanism grip group.
- (4) Barrel assembly, with bipod assembly.
- (5) Receiver group.
- (6) Breech bolt assembly.
- (7) Cover assembly and cartridge tray assembly.
- (8) Forearm assembly.

**:** avoid and prohibit the detailed disassembly of the buffer assembly and the shoulder gun stock group and keep disassembly and assembly of the gas assembly and adjustment of the range plate on the rear sight to the necessary minimum to avoid undue wear.

5

**:** systematically conduct a detailed disassembly of the major groups and assemblies within authorized limits; inspect the parts; and recognize or identify any missing, broken, or worn parts, and replace them.

6

**:** thoroughly clean and properly lubricate the parts; systematically assemble the weapon; check for functioning, including safety; and leave the bore dry (not oiled) in preparation for zeroing.

7

2. THE IRSL WILL TEST FIRE AND ZERO THE M60 MACHINEGUN AS SOON AS PRACTICABLE AFTER RECEIPT OF THE GUN; TEST FIRE AND ZERO THE GUN SUBSEQUENTLY AS REQUIRED TO ENSURE THE DELIVERY OF THE INITIAL BURST AT THE POINT OF AIM; AND USE AN ADJUSTED AIMING POINT WHEN ENEMY TARGETS DEMAND THE IMMEDIATE DELIVERY OF EFFECTIVE FIRE WITHOUT TIME FOR SIGHT ADJUSTMENT.

He will : adjust and use the sights correctly during zeroing and during the delivery of aimed fire, i.e.:

8

- (1) Know that the front sight is fixed.
- (2) Know that the rear sight is adjustable for windage five mils right and five mils left of zero; use one click (one mil) of adjustment of the windage knob to move the line of aim one meter at a range of 1,000 meters; and turn the windage knob toward the gunner to move the rear sight to the left and vice versa.
- (3) Know that the adjustable (to permit zeroing) rear sight range plate is marked for each 100 meters of range from 300 meters to the maximum effective range of 1,100 meters.
- (4) Use the slide release for making major changes in elevation, e.g., from 300 to 700 meters on a zeroed gun.
- (5) Use the elevating knob for making fine adjustments in elevation; know that four clicks on the elevating knob equal a one mil change in elevation; and turn the elevating knob toward the gunner to lower the rear sight elevation and vice versa.
- (6) Use the correct sight picture and correct sight alinement.
- (7) Fold the rear sight forward to the horizontal when the gun is to be moved, stowed, or stored, and during the delivery of assault fire to protect the sight from damage.

He must : zero the M60 machinegun, i.e.:

9

- (1) Know that the center of the beaten zone (strike of the burst) is difficult to see in relation to the target at ranges beyond 700 meters and that a measured range of 500 meters over level or gently sloping terrain is best suited for zeroing the gun for combat use.

- (2) Use the tripod mount for the gun with proper application of the fundamentals of position and grip, sight alinement and sight picture, and trigger manipulation to obtain maximum stability, accuracy, and control; emplace the tripod, mount the gun, and lay the gun on a cleared (safe) target area by manipulating the traversing and elevating mechanism.
- (3) If practicable, enlist the aid of an observer equipped with a binocular to spot the strike of the burst in relation to the target.
- (4) Determine the range to the target and set the range on the rear sight, e.g., at 500 meters; set the windage index at zero; load; and lay the gun on the base of the target (aiming point) with the correct sight alinement and correct sight picture by manipulating the traversing and elevating mechanism.
- (5) Fire a 6- to 9-round burst at the target and note the center of impact of the burst in relation to the target.
- (6) To adjust the rear sight during zeroing, move the rear sight in the same direction that it is desired to move the center of impact of the burst toward the target, e.g., to move bullet strike to the right, move the windage index to the right; to increase the range of bullet strike, raise the rear sight.
- (7) Make any necessary deflection change by moving the rear sight the necessary number of clicks in the direction that it is desired to move the strike of the burst, e.g., at a range of 500 meters, if the center of the beaten zone is two meters to the right of the initial line of aim, move the rear sight four clicks (mils) to the left to bring the burst on target for deflection with the correct sight alinement and correct sight picture.
- (8) Make any necessary range change by moving the rear sight in the direction it is desired to move the center of impact of the burst, e.g., at a range of 500 meters, if the center of the beaten zone is estimated to be 50 meters short of the target, raise the rear sight from the initial reading of 500 meters to a setting of approximately 550 meters to bring center of impact of the burst on target for range with the correct sight alinement and correct sight picture.

- (9) After making the necessary sight changes, again lay the gun on the target with the correct sight alinement and correct sight picture, fire a confirming burst, and note the center of impact of the burst in relation to the target (aiming point).
- (10) If the strike of the burst (center of the beaten zone) centers on the target for both deflection and range, adjust the range plate, i.e., loosen the range plate screw; move the adjustable range plate so the correct range graduation (500 meters in the example cited) coincides with the top left edge of the rear sight slide; then tighten the range plate screw and record the deflection (four mils left in the example cited) for future reference.
- (11) If the strike of the confirming burst does not center on the target, repeat the sight adjustment procedures by treating each subsequent burst as if it were an initial burst until the gun is zeroed, then adjust the range plate and record the deflection.
- (12) Unload and clear the gun upon completion of zeroing.

- He will : zero the bipod-mounted gun (when no tripod is available) by following essentially the same procedures as required for zeroing from the tripod mount except to lay the gun through proper application of the fundamentals of position and grip as applicable to use of the bipod mount. 10
- He must : note the functioning of the gun during zeroing, correct the cause of any malfunction or stoppage, and fire several six- to nine-round bursts to test fire the gun. 11
- He will : seek habitually to obtain an accurate initial burst during delivery of fire at enemy targets; if a target is missed despite correct sight alinement and a correct sight picture, select a new aiming point on the ground the same distance from the target as the center of impact of the initial burst, but in the opposite direction, and fire a second burst, i.e., use an adjusted aiming point until time becomes available to zero the gun. 12
- : require any assigned crew member or supernumerary to report the necessity to repeatedly use an adjusted aiming point and ensure that the gun is zeroed as soon as time permits. 13



He must : ensure through instruction, demonstration, and supervised performance that all machinegun crew members and supernumeraries within or attached to his squad can zero and test fire the machinegun from both the bipod and the tripod, and recognize the need for and use an adjusted aiming point as necessary to deliver effective fire.

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3. THE IRSL WILL SELECT AND DESIGNATE POSITIONS FOR EMPLACING THE TRIPOD- OR BIPOD-MOUNTED M60 MACHINEGUN ORGANIC OR ATTACHED TO HIS SQUAD; ASSIGN SECTORS AND MISSIONS WITH PRIORITIES TO OBTAIN MAXIMUM EFFECTIVE FIRE; AND DELIVER OR SUPERVISE AND CONTROL THE DELIVERY OF EFFECTIVE DIRECT FIRE AT RANGES OUT TO 1100 METERS UNDER WIDELY VARYING CONDITIONS OF TERRAIN AND UNDER CONDITIONS OF VISIBILITY VARYING FROM FULL, UN-OBSURED DAYLIGHT THROUGH ARTIFICIAL ILLUMINATION DURING DARKNESS TO INCLUDE VISIBILITY SEVERELY LIMITED BY SMOKE, INCLEMENT WEATHER, DARKNESS, AND THICK VEGETATION, SINGLY AND IN COMBINATION.

He will : know the characteristics of the M60 machinegun, ammunition, and tripod which are essential to obtaining maximally effective fire;

15

- (1) Maximum range is 3725 meters and fire is usually delivered in bursts of six to nine rounds; therefore, fire must be carefully planned and controlled to avoid inflicting casualties upon any friendly troops or friendly indigenous personnel beyond any target being engaged, e.g., friendly troops in blocking positions.
- (2) Maximum effective range is 1100 meters; however, the majority of visible enemy personnel targets are likely to be engaged at ranges under 400 meters. (Both binoculars and night-vision sights are required for the most effective detection and identification of targets under all levels of visibility.)
- (3) Maximum extent of grazing fire obtainable over level or uniformly sloping terrain is 600 meters; however, to obtain the maximum is a rarity; and particular attention must be paid to obtaining the maximum possible extent within the limits imposed by the terrain.
- (4) Bursts of 7.62-mm fire from the M60 machinegun are significantly more effective in penetrating thick brush, enemy earthworks, frame buildings, etc., than similar fire from the rifles within the squad.

- (5) Ball, tracer, armor-piercing, and armor-piercing incendiary ammunition types are provided in combat and the gunner must select from the ammunition available the types likely to be most effective for specific targets.
- (6) Tracer burn becomes visible 75 to 100 meters from the gun muzzle; tracer burnout occurs at approximately 900 meters; and the observation of tracer is vital to rapid, accurate adjustment of fire.
- (7) The M60 machinegun weighs 23 pounds and an attached, 100-round bandoleer weighs approximately 6 pounds; therefore, strength, muscular coordination, and stamina of a high degree demand attention in the selection of gunners and assistant gunners, i.e., the machinegun must be "man-handled," particularly in offensive action, such as the delivery of assault fire.
- (8) Two barrels are provided for each gun and fixed headspace facilitates rapid barrel change to prevent overheating.
- (9) The sustained rate of fire permits firing 100 rounds in bursts of 6 to 9 rounds at 4- to 5-second intervals with a barrel change required every 10 minutes.
- (10) The rapid rate of fire permits firing 200 rounds per minute in bursts of 6 to 9 rounds at 2- to 3-second intervals with a barrel change required every two minutes.
- (11) The cyclic rate of fire permits firing approximately 550 rounds per minute with a barrel change required every one minute.
- (12) The M122 tripod mount, with traversing and elevating mechanism and platform and pintle group, weighs 19.5 pounds; the tripod mount is essential to the most effective delivery of prearranged fire during limited visibility and to the delivery of overhead fire; and leaders must guard against the tendency of crew members toward storage or abandonment of the tripod mount because of its weight and bulk.
- (13) Elevation and depression, tripod controlled, are from +200 mils to -200 mils.

- (14) Elevation and depression on the tripod mount with free gun are from +445 mils to -445 mils.
- (15) Traverse controlled by the tripod traversing and elevating mechanism is 100 mils, i.e., the gunner can mechanically traverse a target 100 meters wide at a range of 1,000 meters or traverse a 50-meter wide target at 500 meters.
- (16) The normal sector of fire with the tripod is 875 mils (approximately 45 degrees); each gun is usually assigned a primary sector of fire and a secondary sector of fire, thus machinegun fire can be applied across the entire front of the small unit being supported. (Full traverse of the primary sector is obtained by loosening the slide lock lever so the elevating mechanism slides freely on the traversing bar. Full traverse of the secondary sector is possible with a free gun.)
- (17) The distinctive sound of bursts of machinegun fire, plus visible muzzle flash, smoke, and dust from muzzle blast, coupled with the lethal effect of the fire upon the enemy, virtually demand that the enemy silence the gun; therefore, local security and maximum use of cover and concealment (commensurate with effective fire delivery) are essential. A machinegun isolated from protective friendly troops invites destruction as soon as it opens fire or is otherwise discovered, particularly when operating against guerrillas.

He must : know and exploit the following characteristics of M60 machinegun fire when selecting machinegun positions, assigning missions, planning fire delivery, and controlling or delivering fire:

16

- (1) Trajectory is the path of the bullet in flight and is almost flat to a range of 300 meters. Beyond 300 meters the trajectory curves increasingly downward with increasing range.
- (2) Maximum ordinate is the highest point which the trajectory (bullet path) reaches above an imaginary line extending from the gun muzzle to the target base. Maximum ordinate is reached at approximately two-thirds of the gun-target range and increases as the range increases, e.g., it is approximately:
  - 1 meter high at 600 meters range.
  - 3 meters high at 800 meters range.
  - 6 meters high at 1,000 meters range.

- (3) Cone of fire is the cone-shaped pattern formed by the slightly different trajectories of the bullets in each burst of fire. This pattern increases the lethality of machinegun fire.
- (4) Beaten zone is the ground area struck by the cone of fire. On level or uniformly sloping terrain, the beaten zone forms an elliptical pattern that increases in width and decreases in length as range increases, e.g., it is:
  - 1x100 meters at 400 meters range.
  - 1.5x75 meters at 800 meters range.
  - 2x50 meters at 1100 meters range.
 Fires delivered into falling ground lengthen the beaten zone. Fires delivered into rising ground shorten the beaten zone.
- (5) Center of impact is the center of the beaten zone and it coincides with the line of aim from a properly zeroed gun.
- (6) Danger space is the space between the gun and the far end of the beaten zone where the trajectory does not rise above the height of a standing soldier (1.8 meters). On level or uniformly sloping terrain, danger space exists to a range of approximately 700 meters.
- (7) Dead space exists with respect to machinegun fire when variations in the terrain, such as streams, ravines, shell craters, and similar depressions in the ground, will shelter the enemy or allow passage under the fire without danger. Dead space must be covered with indirect fires, trip- or pull-wired fire sources, or accurate grenade launcher fire.

He will : know that machinegun fire is classified with respect to the ground, the target, and the gun as an aid toward the selection of the most useful machinegun positions in any situation and to provide a basis for delivering the most effective fire from the position(s) selected for the gun upon any target requiring engagement. 17

: classify fire with respect to the ground as: 18

- (1) Grazing fire when the center of the cone of fire does not rise over one meter; know that a maximum of 600 meters of grazing fire can be obtained over level or uniformly sloping terrain; and habitually seek defensive positions that will provide the maximum extent of grazing fire for a tactically significant final protective line or for a sector of graze fire.
- (2) Plunging fire when the danger space is confined to the beaten zone; know that plunging fire is obtained when firing at long ranges, when firing from high ground into low ground, and when firing into abruptly rising ground; and recognize that plunging fire is usually less desirable than grazing fire except when it permits the delivery of supporting fire over the heads of friendly troops.

: classify fire with respect to the target as:

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- (1) Frontal fire when the long axis of the beaten zone is at a right angle (perpendicular) to the target's front.
- (2) Flanking fire when delivered against the target's flank.
- (3) Oblique fire when the long axis of the beaten zone is at an angle other than a right angle to the target.
- (4) Enfilade fire when the long axis of the beaten zone coincides or nearly coincides with the long axis of the target; recognize that enfilade fire is either frontal (against a column) or flanking (against a line) and is the most lethal type of fire because it makes maximum use of the beaten zone.

: classify fire with respect to the gun as:

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- (1) Fixed fire when delivered against a target requiring a single aiming point, i.e., a point target or a target taken in enfilade where the beaten zone covers the entire target.
- (2) Traversing fire when distributed in width by successive changes in direction with a burst of fire delivered after each change in direction, e.g., with the tripod-mounted gun, make four- to six-mil changes with the traversing handwheel and fire a burst after each change to ensure adequate target coverage.



- (3) Searching fire when distributed in depth by successive changes in direction with a burst of fire delivered after each change of direction, e.g., with the tripod-mounted gun, make two-mil changes with the elevating handwheel over level or uniformly sloping ground and fire a burst after each change. Increase the amount of change when firing into rising ground and decrease the amount of change when firing into falling ground as required by observation of strike.
- (4) Traversing and searching fire when distributed in width and depth by successive changes in direction and elevation with a burst of fire delivered after each combined change in direction and elevation, e.g., with the tripod-mounted gun, make four- to six-mil changes in direction with the traversing handwheel and make elevation changes with the elevating handwheel as required by the shape of the terrain and the angle of the target between bursts as indicated by observation of strike.
- (5) Swinging traverse fire when delivered against targets too wide or moving so rapidly across the gunner's front that effective fire cannot be maintained by using the traversing handwheel, i.e., with the tripod-mounted gun, loosen the traversing slide lock lever to allow the traversing and elevating mechanism to slide freely on the traversing bar; make changes in direction by applying pressure to the rear of the gun; and make minor changes in elevation with the elevating handwheel.
- (6) Free gun fire when delivered from the tripod mount against targets requiring rapid, major changes in direction and elevation which cannot be effectively applied with the traversing and elevating mechanism, i.e., with the tripod-mounted gun, loosen the traversing slide lock lever and lift the traversing and elevating mechanism from the traversing bar to allow the gun to be moved freely in any direction. With the vehicular mount, allow the weapon to rest freely on the mount. With the tripod or vehicular mount, make changes in direction or elevation by applying pressure to the rear of the gun.

: to deliver fixed fire from the bipod- or vehicular-mounted gun, fire a burst or a series of bursts, as required, at a single aiming point.

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- : to deliver traversing, searching, or traversing and searching fire from the bipod- or vehicular-mounted gun, select a series of successive aiming points along the base of the target and fire a succession of aimed bursts with spacing between aiming points to ensure overlap of the beaten zone as indicated by observed strike. 22
- He must : recognize that accurate range determination is essential to: 23
- (1) Properly zeroing the machinegun.
  - (2) Selecting firing positions that will provide the most effective fields of fire, particularly as pertains to the FPL (extent of grazing fire), and overhead fire.
  - (3) Obtaining the initial burst on any target (surprise fire) or with minimum adjustment after engagement.
  - (4) Designation of targets for engagement by an assigned gunner.
  - (5) Reporting the location of the machinegun position with respect to a prominent terrain feature (polar coordinate), e.g., during preparation of the range card.
- : determine range accurately to the nearest 100 meters by: 24
- (1) Estimating by eye using the appearance-of-objects method or by applying the 100-meter unit-of-measure method, with due attention to the factors affecting range determination when estimated by eye.
  - (2) Measuring gun-target distances on a map or aerial photograph.
  - (3) Firing the tripod-mounted, zeroed gun, i.e., adjust fire so the observed center of impact is on the base of the target; without disturbing the lay of the gun, reset the rear sight slide so the new line of aim is on the base of the target; and read the correct range from the rear sight.
  - (4) Obtaining range data (e.g., range cards) from other organizations, as during a relief in place.

- (5) Pacing the gun-target distance (when the situation will permit) and converting the individual pace count to meters.
  - (6) Applying the crack-and-thump method, when practicable, to determine both range and azimuth to enemy weapons.
- He will : measure lateral distance right or left from a reference point to a target to aid target designation by: 25
- (1) Aiming the tripod-mounted gun at a reference point and counting the clicks (mils) on the traversing handwheel from the reference point to the target.
  - (2) Using the finger measurement method.
  - (3) Using the horizontal mil scale on the binocular, when available. (Use of binoculars is covered in the IRSL paper on Use of Indirect Supporting Fires and is not repeated herein.)
- He must : require correct use of the terms and adherence to related guidelines applicable to the designation of positions, the assignment of missions, and the engagement of targets within assigned sectors with special emphasis upon the terms and related guidelines pertinent to the delivery of effective machinegun fire during limited visibility. 26
- : know that a primary position is that location which provides the best observation and fields of fire for accomplishing the assigned mission with due attention to cover, concealment, local security, control, and re-supply. 27
- : know that an alternate position is a position selected to be occupied when the primary position becomes untenable or unsuitable and is so located that the weapon can continue to fulfill its original mission. 28
- : know that a supplementary position is that location which provides the best means to accomplish a task that cannot be accomplished from the primary or alternate position, e.g., during the organization of an area defense, supplementary positions are selected and prepared to defend against an attack from the flanks and rear. 29

: know that a sector of fire for a machinegun is a specific area marked by boundaries and assigned to the crew to be kept under continuous surveillance and covered by fire on order or as demanded by the appearance of targets, and that a machinegun is usually assigned a primary sector of fire and a secondary sector of fire. 30

: adhere to the following guidelines pertinent to the primary and secondary sectors of fire: 31

- (1) Use the tripod mount to cover the primary sector of fire to obtain accurate, controlled fire to the maximum effective range of the gun and to permit the delivery of prearranged fires during limited visibility through use of data taken from the traversing and elevating mechanism and recorded on the range card.
- (2) Limit the primary sector of fire to 875 mils (approximately 45 degrees) covering the most critical target areas to permit full application of the 875 mils of controlled traverse provided by the traversing and elevating mechanism.
- (3) When the terrain permits, locate the inner limit (boundary) of the primary sector to permit the delivery of grazing fire along a final protective line (FLP).
- (4) Give priority to the engagement of targets within the primary sector except when the gun position is directly threatened by more dangerous targets in the secondary sector.
- (5) Use the outer limit (boundary) of the primary sector as a common boundary for the secondary sector.
- (6) Make the secondary sector as wide as the terrain and situation permit to gain maximum coverage across the unit front.
- (7) Select target areas of tactical significance within the secondary sector and engage these and other targets appearing in the secondary sector providing no vital targets are visible in his principal direction of fire.

- (8) Engage targets in the secondary sector by using a free gun, by removing the gun from the tripod mount and using the bipod mount, or by field expedients to deliver prearranged fires during limited visibility.

: know that a final protective line (FPL) is a pre-determined line along which grazing fire is placed to stop an enemy assault and that a well-chosen FPL constitutes the best use of machinegun fire during periods of limited visibility. 32

: adhere to the following guidelines pertinent to the FPL: 33

- (1) Anticipate that terrain will normally restrict grazing fire to less than 400 meters and that the IRPL frequently will specify the azimuth of the FPL for each machinegun to coordinate the final protective fires across the platoon front and with adjacent units.
- (2) Make every attempt to select a position that will permit the delivery of knee-high (one-meter high maximum), grazing, flanking enfilade fire across the squad front and across as much of the platoon front as possible.
- (3) Fix the FPL to correspond to the inner limit of the primary sector of fire, i.e., close to the FEBA, ideally, as part of the final protective fires of the defending unit.
- (4) Fix the FPL as to direction (azimuth) and use a few mils of search when delivering fire to compensate for terrain irregularities.
- (5) When an FPL is assigned, always lay the tripod-mounted gun with the traversing slide on either the extreme left or right side (depending on the side of the sector on which the FPL has been assigned) and position the tripod so the muzzle of the gun points along the FPL. If the bipod-mounted gun must be used to fire the FPL, use field expedients to ensure effective FPL fire, i.e., ensure that the FPL can be fired effectively on order regardless of the level of visibility or the type of mount being employed.
- (6) To obtain the maximum extent of grazing fire over level or uniformly sloping terrain, set the rear sight of the zeroed gun at 500 meters, select an aiming point on the ground at 600 meters, and lay, fire, and adjust on this point to keep the center of the cone of fire no more than one meter above the ground.

- (7) On irregular terrain, obtain grazing fire by placing the range to the break in the terrain on the rear sight, and lay, fire, and adjust on the break.
- (8) Determine and mark deadspace in the FPL by walking the FPL (if practicable) or by observing fire along the FPL, and ensure that deadspace is covered by effective fire from other weapons.
- (9) Know that the delivery of FPL fire takes priority over all other machinegun targets (except assaulting enemy that directly threaten the machinegun position) when the signal is given to deliver final protective fires.
- (10) Know the signal for delivering final protective fires and for lifting these fires, and use the rapid rate to fire the FPL unless it is obvious that a higher rate is necessary to accomplish the mission.

: know that a sector of graze is a wedge-shaped area of terrain, formed by sector limits, which affords continuous knee-high grazing fire (one meter maximum) from the muzzle of the gun out to the first major break in the terrain.

34

: adhere to the following guidelines pertinent to sector of graze fire:

35

- (1) Recognize the potential for obtaining a sector of graze over uniformly sloping or level terrain any time a target can be engaged with the machinegun with a rear sight setting of 600 meters or less.
- (2) Determine the ranges to the extent of grazing fire in a sector of graze by observation of the terrain and by observation of the tracer stream from behind or from a flank of the gun.
- (3) Fire the sector of graze within the primary sector from the tripod mount by using swinging traverse with the correct, recorded elevation.
- (4) Fire the sector of graze within the secondary sector with tripod-mounted gun by freeing the traversing and elevating mechanism, using the tripod mount as a pivot, and using the horizontal log or board technique as a field expedient to control elevation and the limits of deflection.

(5) Fire the sector of graze with the bipod-mounted gun by using the horizontal log or board technique in both sectors.

(6) Ensure that effective sector of graze fire can be delivered regardless of the level of visibility or the type of mount being employed.

: know that a principal direction of fire (PDF) is a priority direction of fire which marks the center of a specific area assigned to a weapon. 36

: adhere to the following guidelines pertinent to the PDF: 37

(1) Recognize that the PDF may extend from the gun position to the maximum effective range of the gun (or to a lesser limit of visibility) with necessary variations in elevation to cover an area providing good fields of fire, a likely avenue of foot approach, or to mutually support an adjacent unit, including coverage of a critical gap between units.

(2) Assign a principal direction of fire day (PDFD) to be covered in good visibility and a principal direction of fire night (PDFN) to be covered during limited visibility in anticipation of variation in enemy use of approach routes during different levels of visibility, e.g., enemy approach routes providing concealment are more likely to be used during good visibility.

(3) Always keep the gun laid on the PDFD during good visibility and on the PDFN during limited visibility, unless other targets are being engaged.

(4) Give priority of fire to visible targets appearing in the PDFD or PDFN over targets appearing elsewhere in the sector, except other targets posing a direct threat to the gun position and FPL fires.

He will : know that an area of graze is an area (other than the sector of graze) over which grazing fire can be obtained within a primary or secondary sector of the machinegun. 38

: adhere to the following guidelines pertinent to areas of graze: 39



- (1) Recognize areas of graze as tactically significant areas likely to be used as enemy approach routes, and know that grazing fire need not be continuous from the muzzle of the gun to be effective over a useful area of graze.
- (2) Determine the ranges to the extent of grazing fire over an area of graze by observation of the terrain and by observation of the tracer stream as for a sector of graze.
- (3) Use traversing fire to cover an area of graze and employ a few mils of searching fire to compensate for terrain irregularities.

He must : know that the value of machinegun fire is such that the IRPL usually will designate positions for and assign missions to the machineguns available to the platoon. 40

: select positions and assign missions to any machine-gun organic or attached to his squad in any combat situation in the absence of instructions from the IRPL covering the employment of the machinegun. 41

He will : during offensive operations, select positions for and assign missions to his organic or attached machinegun, e.g.: 42

- (1) Provide fire support, including appropriate overhead fire, as a part of the base-of-fire element of his squad when tactically significant target areas are apparent and observation and fields of fire will permit such employment.
- (2) Accompany the squad and provide supporting fire, including assault fire when appropriate, during fire and movement by the entire squad preparatory to an assault.
- (3) Accompany the squad and provide supporting fire, including assault fire when required, when the entire squad acts as a maneuver element for the platoon.
- (4) Accompany the squad and provide grazing fire to cover the killing ground or enfilade fire to cover a tactically significant enemy approach route when the squad is engaged in semi-independent ambush missions.

- : in the absence of instructions to the contrary, exercise temporary control over any machinegun accompanying his squad in the attack immediately upon seizing the objective, i.e., designate a temporary position for and assign temporary missions to the machinegun to aid in repelling an enemy counterattack and to provide close-in protection for the gun and crew pending the assignment of a defensive position and missions for the machinegun by the IRPL. 43
- He must : avoid the isolation of any machinegun (organic, attached, or supporting) for which he is responsible; usually employ his machinegun within a fire team or between fire teams to ensure close-in security and thus prevent the gun from being outflanked by the enemy. 44
- : recognize that the isolation of a machinegun is most likely to occur during rapidly moving offensive operations and during retrograde operations under limited visibility conditions. 45
- : plan for, issue specific instructions, and require the prompt displacement of any machinegun for which he is responsible to obtain the maximum of supporting fire from the gun and to ensure against isolation of the gun. 46
- (Additional coverage of the tactical employment of machineguns in offensive operations is included in the IRSL papers on Offensive Operations and Patrolling and is not repeated herein.)
- He will : during defensive operations, select positions for and assign missions to his organic or attached machinegun to obtain maximum grazing fire over the most likely avenues of enemy approach with primary consideration to obtaining maximum coverage of the squad and platoon front with an effective FPL during limited visibility in coordination with the other machineguns employed within the platoon. 47

: know that ground reconnaissance, including visual survey over the gun sights at firing level, is vital to the selection of FPL, sectors of fire, PDF, sectors of graze, areas of graze, and specific targets that will ensure the delivery of the most effective machinegun fire from defensive positions, i.e., the level of detail shown on most tactical maps will not divulge hillocks, ground folds, eroded areas, and similar land forms that will obstruct grazing fire or create dead space, nor will obstructions and dead space be as readily identified from an upright position as from behind the gun at firing level; survey tentatively selected machinegun positions accordingly. 48

: recognize that rain, snow, fog, or enemy use of smoke (singly or in combination) may severely limit visibility at any time, day or night, and select a primary machinegun position with the best possible capabilities for good and limited visibility defense, i.e., selection of an additional separate position for limited visibility use may be desirable in some situations, but a useful good visibility primary position must be prepared to ensure effective fire delivery during limited visibility also because the occurrence of limited visibility (e.g., enemy use of smoke) cannot be predicted to provide time for moving the gun. 49

: select the best available good visibility primary position in any defensive situation on the basis of the following priorities: 50

- (1) Good observation over an acceptable long-range field of fire.
- (2) Good fields of fire for the close defensive fires to include a tactically significant PDFD.
- (3) A tactically significant FPL, i.e., one providing maximum grazing fire across the position or, alternatively, one enfilading a dangerous approach into the position.
- (4) An acceptable potential for limited visibility defense.
- (5) Avoidance of any unusually conspicuous position likely to draw enemy fire.
- (6) A good potential for close-in defense of the position under all conditions of visibility.
- (7) Cover and concealment, including routes into the position.

: select the best available limited visibility primary position in any defensive situation on the basis of the following priorities:

51

- (1) Existence of a tactically significant and technically desirable FPL.
- (2) Good potential for preplanned close defensive fires and for direct close defensive fires where visibility permits, e.g., under moonlight or artificial illumination.
- (3) Avoidance of a crest position or other position likely to silhouette the gun and crew against the skyline from the enemy's point of view, i.e., adequate cover and concealment and routes into the position.
- (4) Capability for delivery of long-range preplanned fires upon likely enemy approach routes and assembly areas.
- (5) Avoidance of a gun position accurately located on maps of the area, hence likely to draw enemy preparatory fires.
- (6) A good potential for close-in defense of the position.

: select alternate and supplementary positions and assign machinegun missions as required by the squad mission and the specific situation.

52

: when a temporary position is occupied to cover the squad and platoon front with grazing fire while the defense is being organized, ensure rapid organization and direct movement of the gun to the designated primary position as soon as possible to increase the flexibility and effectiveness of fire and to gain the advantage of increased cover and concealment at the primary position.

53

He must : after the selection and designation of a machinegun position(s) and the assignment of missions, require work to be accomplished as rapidly as time permits in accordance with the following priority:

54

- (1) Clear fields of fire and maintain camouflage and concealment concurrently with work.

- (2) Prepare a hasty emergency emplacement as close to the primary position as the assigned fire missions permit.
- (3) Prepare a horseshoe position for the gun with proper gun platform depth to ensure maximum cover for the gun commensurate with the assigned missions.
- (4) Prepare other positions for crew members as required by crew strength.
- (5) Minimize dust caused by muzzle blast by dampening the ground or placing wet sandbags forward of the gun muzzle.
- (6) Construct overhead protection.
- (7) Prepare a bunker.

: ensure through instruction, demonstration, supervised performance, and inspection that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can select useful machinegun positions and assign effective missions without assistance against the possibility that he (IRSL) may become a casualty. 55

He will : explain, demonstrate, and supervise the use of the traversing bar and traversing and elevating mechanism method of laying the machinegun to effectively engage preselected targets within the primary sector of fire during limited visibility. (For details see FM 23-67.) 56

: emphasize the absolute necessity to obtain and record data correctly in mils when laying the gun in preparation for later engagement of preselected targets during limited visibility. 57

: when the situation permits, verify the lay of the gun on the preselected targets by firing and adjusting on each target prior to taking and recording the data for use during limited visibility. 58

He must : know that field expedients serve as a primary means of engaging preselected target areas in a secondary sector during limited visibility, and that field expedients may be used as a primary means in the primary sector until time or better visibility permit recording data on the range card from the traversing bar and traversing and elevating mechanism. 59

- : explain, demonstrate, and supervise the construction and use of the following field expedients to effectively engage preselected target areas during limited visibility: 60
- (1) Aiming stake technique as used with the tripod-mounted gun to engage preselected targets.
  - (2) Base stake technique as used with the tripod-mounted gun to define a sector limit, to lay the gun to engage a final protective line, and to lay the gun to engage other target areas on a sector limit.
  - (3) Notched stake or tree crotch technique as used with the bipod-mounted gun to engage preselected targets within a sector or to define sector limits.
  - (4) Horizontal log or board technique as used with the bipod- or tripod-mounted gun to mark sector limits and provide sector of graze fire.
- He will : explain, demonstrate, and supervise the preparation and use of luminous field-expedient night sights for the M60 machinegun to facilitate the engagement of visible point targets during darkness, i.e., use luminous or white paint, tape, or pliable metal strips on the front and rear sights so the sights can be seen and aligned on visible point targets during darkness. 61
- He must : know that a range card is an accurate, easily legible record of the firing data necessary to engage preselected target areas within a sector(s) of fire during periods of limited visibility. 62
- : adhere to the following general guidelines pertinent to the preparation and use of range cards: 63
- (1) Require the gunner, assisted as necessary by the assistant gunner and the IRSL, to prepare the range card for the primary position in duplicate immediately upon designation of the position and the assignment of missions for the machinegun.
  - (2) Ensure that each range card is large enough as to overall size and size of letters and numerals to be easily legible with minimum artificial light at the gun position, e.g., one-inch letters and numbers in black on a white background can be read in bright starlight without artificial light; reduction from this size or light level will require artificial light.



- (3) Provide a duplicate copy of each range card for the platoon leader to aid him to locate the gun accurately on his map and to prepare his fire plan.
- (4) Continually revise the data shown on both sections of the range card throughout the occupation of a position as required by the need to adjust fire on preselected target areas and the identification of additional tactically significant targets.
- (5) Memorize the locations and target numbers of the most significant targets and use the target numbers to designate targets for immediate engagement during all levels of visibility. (Use of binoculars and image intensification devices, when available, will facilitate target detection and identification.)
- (6) Require range cards to be completed for alternate and supplementary positions as time and the availability of data permit, but give first priority to the range card for the primary sector of the primary position as demanded by the assigned mission.
- (7) When a relief occurs at the gun, require the range card(s) to be turned over to the relieving gunner. (Follow the same practice when one unit relieves another.)

: without reference or notes, prepare a complete and accurate range card for both the primary and secondary sectors of fire for a typical defensive machinegun position, including a FPL broken by dead space, sector boundaries, PDFD, PDFN, SG, AG, significant additional targets, field expedient data for the secondary sector, orientation data, complete and accurate entries for number, direction, elevation, range, description, and remarks for each target listed in the data section and use the card to effectively engage all targets shown under both good and limited visibility. (For details see FM 23-67.)

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: ensure through instruction, demonstration, supervised performance, and inspection that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can prepare, use, and revise range cards accurately to engage preselected targets during limited visibility.

65

- He will : know that fire control includes all actions of the leader and members of the machinegun crew pertinent to the preparation for and application of effective fire on a target, i.e., the ability to select and designate appropriate targets for the machinegun, open fire at the desired instant, adjust fire, regulate the rate of fire, shift from one target to another, and cease fire. 66
- : diagram and label the general directions commonly used in controlling fire as an aid to instructing potential machinegunners and use this standard terminology in designating general directions, i.e., front, right front, right flank, right rear, rear, left rear, left flank, and left front. 67
- : when noise and proximity to the gunner permit, correctly use oral initial and subsequent fire commands, corrections, and repetitions to place fire on a target and to adjust or shift fire as required, i.e.: 68
- (1) Provide alert, direction, description, range, method of fire, and command to open fire in the initial fire command.
  - (2) Provide adjustment for direction first, followed by adjustment for range, and, as necessary, change in rate of fire, in subsequent fire commands.
  - (3) Preface repetitions in answer to a gunner's query with THE COMMAND WAS. . .and repeat the doubtful element.
  - (4) Preface the correction of an error in a fire command with CORRECTION, then state the corrected element.
  - (5) Interrupt firing with CEASE FIRE.
  - (6) Terminate an alert by ordering CEASE FIRE, END OF MISSION.
- : designate target locations or boundaries by pointing, laying the gun, firing tracer, and by use of reference points. 69
- : when visibility permits, use SOP arm-and-hand signals for READY, COMMENCE FIRING, FIRE FASTER, FIRE SLOWER, LEFT, RIGHT, ADD, DROP, and CEASE FIRE. 70

: anticipate that limited visibility, battle noise, physical separation from the gun position, enemy fire requiring use of cover, immediate need for surprise fire on moving targets, and demands to observe and control other elements of his squad often will severely limit his ability to control the fire of an organic or attached machinegun and establish SOP for employment by crew members, e.g.:

- (1) Continuing surveillance SOP, i.e., the gun is manned and the primary and secondary sectors of fire kept under continuing surveillance by a minimum of one qualified gunner unless otherwise directed by the leader.
- (2) Search-fire-check SOP, i.e., during all alerts, crew members search the sectors for targets; the gunner opens fire automatically on appropriate targets within his sector; and assistants check the leader at frequent intervals for instructions while the gunner is firing.
- (3) Return fire SOP, i.e., the gunner returns fire without order, concentrating on automatic weapons.
- (4) Shifting fires SOP, i.e., the gunner engages all appropriate targets in his sectors and shifts his fire when more dangerous targets appear.
- (5) Rate of fire SOP, i.e., when the gunner engages a target, he fires at the rate necessary to gain fire superiority, then decreases the rate to a point sufficient to maintain fire superiority.
- (6) Limited visibility SOP, i.e., when targets within his sectors become visible to the gunner, he must engage these targets without command and continue to fire until the targets have been neutralized.

(Additional coverage of the tactical employment of machineguns in the defense is included in the IRSL paper on Defensive Operations and is not repeated herein.)

He must : adhere to and require adherence to specific guidelines to ensure the rapid engagement and systematic coverage of enemy targets with one organic or attached machinegun under all light conditions that will permit the visual detection of point targets and enemy tactical formations, i.e.:

- (1) Give first priority to the engagement of targets or portions of targets that pose a direct threat to the machinegun and crew, with particular emphasis upon enemy automatic weapons (muzzle flash) and assaulting enemy during limited visibility, because defense of the gun position is vital to the continued delivery of effective fire.
- (2) Except when countering a direct threat to the machinegun position, lay and adjust initially on the center of mass of enemy tactical formations to cause casualties among enemy leaders located in control positions, to cause confusion, and to fix the target for continuing systematic coverage.
- (3) Engage point targets with fixed fire and follow any movement of a point target with the gun on the basis of observed bullet strike (when visible) and the tracer stream.
- (4) Engage the entire width of a linear target by laying and adjusting initially on the midpoint, traverse to the most critical (e.g., nearest) flank, then reverse the direction of traverse to cover the remainder of the target.
- (5) Engage all of a deep target by laying and adjusting initially on the midpoint, search down to the near end, then search up to cover the remainder of the target.
- (6) Engage all of a linear target with depth by laying and adjusting initially on the midpoint, traverse and search to the near flank, then traverse and search to the far flank to cover the remainder of the target.
- (7) Engage all of an area target by laying and adjusting initially on the center of mass, traverse and search to the most critical flank, then traverse and search to cover the remainder of the target.
- (8) Avoid indiscriminate fire at noises and suspected target areas during darkness to prevent the enemy from locating the gun by drawing fire through ruses.
- (9) Place initial fire low at the base of the target during darkness and adjust upward, if necessary, to avoid the tendency to shoot high in the dark.

: ensure through instruction, demonstration, and supervised performance that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can recognize and designate appropriate machinegun targets, use and react effectively to fire commands and commonly used control measures, and apply machinegun fire effectively and systematically on order or on the initiative of the gunner when the IRSL is prevented by other duties from exercising direct control over an organic or attached gun.

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He will : when an organic machinegun (mechanized unit) is manned by a rifleman or when the crew of an attached machinegun is reduced to a gunner as a result of casualties, position an additional rifleman with the machinegun to provide close-in security and to take over the gun in the event the gunner becomes a casualty.

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4. THE IRSL WILL DELIVER OR REQUIRE AND SUPERVISE THE DELIVERY OF ASSAULT FIRE WITH THE M60 MACHINEGUN WHEN THE WEAPON AND CREW ACCOMPANY HIS SQUAD IN THE ASSAULT.

He will : habitually employ organic or attached M60 machineguns to obtain the maximum volume of effective fire during contact and recognize that the delivery of assault fire with the machinegun during a night attack or during a daylight assault or meeting engagement, particularly in heavily vegetated terrain, may provide a heavy volume of effective fire that would not otherwise be available.

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: adhere to and require adherence to the following demands during the delivery of assault fire with the machinegun:

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- (1) Keep the rear sight down, deliver fire effectively without visually aligning the sights, and adjust fire by observing the tracers and bullet strike in the target area.
- (2) Move as rapidly as possible consistent with ability to fire accurately; maintain alignment by guiding on the designated base man, by visual contact to the flanks, and by sensing friendly muzzle flash and blast to the flanks; and avoid stopping (except to pause momentarily to fire) that would disrupt alignment and possibly endanger friendly troops.

- (3) Distribute fire with rapid adjustment to cover as much of the objective area as possible without endangering friendly troops and give fire priority to enemy automatic weapons and close, dangerous targets.
- (4) Reload rapidly to obtain maximum effective fire on the objective area throughout the assault with or without the aid of an assistant gunner (who may become a casualty). Inspect and prepare ammunition for rapid reloading prior to need to reload.

He must : use and supervise use of the hip firing position, shoulder firing position, and the underarm firing position for delivering assault fire and apply or require application of the following actions common to all three positions:

- (1) Attach the sling to the gun and place it over the left shoulder (right-handed gunners) to aid in supporting the weapon during firing, reloading, and when reducing stoppages.
- (2) Keep the rear sight down and the bipod legs down and ready for instant use if needed. (If the gun must be carried and fired in thick vegetation, it will be necessary to fold the bipod legs to permit rapid movement and unimpeded adjustment and distribution of fire.)
- (3) Grasp the handguard of the forearm assembly firmly with the left hand.
- (4) Grasp the trigger mechanism grip group firmly with the right hand leaving the trigger finger free.
- (5) Keep the left foot forward and pointed toward the target during firing.
- (6) Position the right foot to the rear and pointed generally to the right to gain maximum stability.
- (7) Lean toward the target (into the gun and against the recoil) before and during firing.

: use or require the use of the hip firing position to gain good firing stability when a heavy volume of fire is demanded in the target area and rapid movement is not essential, but recognize that this position is awkward to use while moving. When firing from this position:



(1) Hold the rear of the stock firmly against the forward portion of the right thigh.

(2) Fire bursts of not less than nine rounds.

: use or require the use of the shoulder firing position to gain accuracy required to hit point targets, but recognize that the gunner must pause momentarily to fire and thus cannot move rapidly. When firing from this position.

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(1) Hold the butt of the stock firmly into the right shoulder.

(2) Aim by placing the top of the front sight blade at the center base of the target or at the center of mass of close, upright enemy.

(3) Pause momentarily and fire a burst of six rounds maximum after every two or three steps as the left front strikes the ground or as demanded by the appearance of close, dangerous targets that must be engaged.

: use or require the use of the underarm firing position to move rapidly and deliver a heavy volume of fire when closing with the enemy in a daylight assault and throughout the assault during limited visibility. When firing from this position:

80

(1) Hold the weapon firmly between the right arm and the right side of the chest.

(2) Move continuously and fire short bursts (maximum of six rounds) each time the left foot strikes the ground.

He will : use and require his gunners to use assault fire techniques to engage close, dangerous targets during movement in reaction to enemy ambush or in any similar situation where time pressure demands the immediate delivery of effective fire.

81

: recognize the need for and require his gunners to carry the machinegun slung in a ready-to-fire position during movement as a matter of habit to permit immediate delivery of fire upon any targets that appear suddenly without warning.

82



- : know, and impress upon his machinegunners, that muscular development over time through regular practice in training and combat is vital to prolonged carrying of a loaded M60 machinegun in a ready-to-fire position and that the time required to move the gun from a shoulder carry to a firing position may cost a gunner his life or a serious wound when the enemy is encountered suddenly at short range. 83
- : warn his gunners against purely reflexive delivery of fire against perceived (seen or heard), but unidentified, targets, particularly when visibility is limited by darkness, rain, dense brush, elephant grass, etc., to avoid the tragic delivery of lethal fire against friendly personnel. 84
- He must : ensure through instruction, demonstration, and supervised performance that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can, under all conditions of visibility and without the aid of an assistant gunner, deliver effective assault fire with the M60 machinegun. 85
- : impress upon his crew members and potential machinegunners that the volume of effective fire from the M60 machinegun in the assault exceeds that of any other shoulder weapon available to the squad; designate the order in which crew members are to take over the gun in the event casualties occur; and ensure that effective fire in heavy volume is delivered from the machinegun throughout the assault. 86
5. ON ORDER OR AS DEMANDED BY THE SITUATION, THE IRSL WILL ENGAGE AND SUPERVISE THE ENGAGEMENT OF AERIAL TARGETS WITH THE M60 MACHINEGUN ORGANIC OR ATTACHED TO HIS SQUAD UNDER ALL CONDITIONS OF VISIBILITY THAT WILL PERMIT THE OBSERVATION OF ENEMY TARGETS IN RELATION TO THE TRACER STREAM.
- He will : recognize that enemy fixed-wing aircraft, helicopters, and descending parachutists are vulnerable to small arms fire, particularly at altitudes (ranges) below 1500 feet. 87
- : during operations as part of his parent unit, adhere to the unit SOP governing the engagement of aerial targets, e.g.: 88

- (1) Under effective air attack by enemy fixed-wing aircraft or helicopters, deliver fire with the M60 machinegun and all available small arms against attacking aircraft within effective range except when close, dangerous ground targets (e.g., assaulting enemy) demand fire priority.
- (2) Engage enemy transport aircraft and descending enemy parachutists within effective range with the M60 machinegun and all available small arms and commence use of tripod- or bipod-supported grazing fire as ground targets become available.
- (3) Adhere to restrictions imposed by the commander regarding the engagement of enemy aircraft.

: when his squad is separated from the parent unit (e.g., on semi-independent reconnaissance patrols and ambushes), engage enemy aircraft within effective range only when engagement is vital to the survival of the unit and will contribute to the accomplishment of the mission, i.e., recognize that detection of his unit as a result of ill-considered engagement is likely to draw fire and result in mission failure. 89

He must : engage aerial targets with the M60 machinegun by using the hip firing position or free gun from the tripod. (Vehicular mounts for M60 machineguns are not usually available to the IRSL; if available, the free gun technique is applicable.) 90

: use 4 ball and 1 tracer ammunition if immediately available for ease of observation and adjustment of fire and to ignite aircraft fuel cells penetrated by the fire. 91

: direct fire in front of aircraft (lead) at the cyclic rate of fire, observe the tracer stream, and adjust fire as necessary. 92

: distribute fire against descending enemy parachutists as demanded by the pattern of the targets. 93

He will : through instruction, demonstration, and supervised performance, ensure that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can effectively engage aerial targets with the M60 machinegun and that they know and adhere to unit SOP pertinent to such engagement. 94

6. ON ORDER, THE IRSL WILL EMPLACE THE TRIPOD-MOUNTED M60 MACHINEGUN ORGANIC OR ATTACHED TO HIS SQUAD, ESTABLISH THE SAFETY LIMIT, AND DELIVER OR SUPERVISE THE DELIVERY OF SAFE AND EFFECTIVE OVERHEAD FIRE AT RANGES FROM 350 TO 850 METERS IN SUPPORT OF FRIENDLY TROOPS. HE WILL CEASE FIRE ON ORDER OR WHEN THE SUPPORTED TROOPS REACH THE SAFETY LIMIT.

- He will : know that supporting machinegun fire can be safely and effectively delivered over the heads of friendly troops at enemy targets between 350 and 850 meters from the machinegun when terrain and visibility permit by systematically establishing a safety limit between the supported troops and the target and ceasing or shifting fire when the troops reach the safety limit. 95
- : know that overhead fire cannot be safely delivered at a target beyond 850 meters from the gun and cannot be delivered safely over level or uniformly sloping terrain. (When a machinegun is fired from the tripod [or bipod] mount on level or uniformly sloping terrain at a target less than 700 meters from the gun, the trajectory will not rise above the average height of a standing soldier.) 96
- : know that the line of aim must be well above the heads of the supported troops during all overhead fire delivery. 97
- : recognize levels of visibility and the relative terrain elevations of useful machinegun positions, friendly troop movement routes, and known or suspected enemy target locations likely to permit the delivery of safe and effective overhead fire and point out or report these conditions to the platoon leader when applicable to the assigned mission and to current or anticipated situations. 98
- He must : know that the safety limit during the delivery of supporting overhead machinegun fire is an imaginary line on the ground, as marked by two or more clearly visible and easily identified reference points (trees, boulders, etc.), beyond which the supporting fire may endanger advancing friendly troops. 99
- : to establish the safety limit by observation: 100

- (1) Use binoculars to observe fire delivered on the target from the supporting machinegun and fix a safety limit prior to any possible exposure of friendly troops. (Use of binoculars is covered in the IRSL paper on Use of Indirect Supporting Fires and is not repeated herein.)
- (2) Use binoculars to observe fire delivered in support and cease firing or shift to new targets for which safety exists before the advancing friendly troops reach the safety limit.
- (3) Recognize that the early delivery of fire to establish a safety limit will alert the enemy and fix the safety limit by application of the gunner's rule procedure when maximum surprise fire is desirable.

: to achieve maximum surprise fire, fix the safety limit prior to firing the machinegun by using the gunner's rule procedure, i.e.:

101

- (1) Ensure that the machinegun to be employed is accurately zeroed.
- (2) Ensure that the target is between 350 and 850 meters from the machinegun and that the range to the target is correctly determined.
- (3) Set the correctly determined range on the rear sight.
- (4) Lay the gun to hit the target by manipulating the traversing and elevating mechanism.
- (5) Without disturbing the lay of the gun, raise the rear sight slide to 1,100 meters.
- (6) Depress the muzzle of the machinegun 10 mils (clicks) by using the elevating handwheel.
- (7) Look through the rear sight and note the point where the new line of aim strikes the ground. Fix an imaginary line through this point and parallel to the target as the safety limit.
- (8) Reset the range to the target on the rear sight, relay on the target, and prepare to fire.

He will : adhere to the following safety precautions during preparation for and delivery of supporting overhead fire from the M50 machinegun:

102

- (1) Limit the delivery of overhead fire to gun-target ranges between 350 and 850 meters.
- (2) Inform the commanders of friendly troops over whose heads fire is to be delivered, and, when practicable, arrange with the leader of the element being supported to direct delivery and lifting or shifting of fire at the proper times by prearranged signals to gain surprise, ensure safety, and to conserve ammunition.
- (3) Firmly emplace the tripod mount to avoid shifting during firing.
- (4) Fix the safety limit and use depression stops to prevent the muzzle of the gun from accidentally being lowered below the safety limit.
- (5) Ensure that all members of the gun crew know and can point out the ground location of the safety limit.
- (6) Do not deliver overhead fire through barbed wire, trees, or any obstruction which might deflect bullets into friendly troops.
- (7) Do not use any barrel which has excessive muzzle blast or is otherwise determined to be badly worn.

He must : recognize that the sound of a machinegun delivering fire is an unmistakable cue to its identify and location; anticipate the possible isolation of machineguns used to support advancing troops; and provide adequate local security to ensure against capture or destruction, particularly in areas infested with guerrillas. (This is applicable in all situations, not merely during delivery of overhead fire.)

103

He will : recognize that the delivery of overhead machinegun fire often may be the best possible means of supporting a maneuver element, including elements pinned down by enemy fire; ensure through instruction, demonstration, and supervised performance that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can emplace the gun, establish the safety limit, and deliver safe and effective overhead fire on order.

104

7. ON ORDER OR AS DEMANDED BY THE SITUATION, THE IRSL WILL REQUIRE AND SUPERVISE THE EMPLACEMENT OF AN ORGANIC OR ATTACHED M60 MACHINEGUN IN MINIMUM POSITION DEFILADE OR IN PARTIAL POSITION DEFILADE AND DELIVER OR SUPERVISE AND CONTROL THE DELIVERY OF EFFECTIVE FIRE FROM SUCH POSITIONS.

- He will : know that while maximum effectiveness usually is achieved by employing direct laying, the use of minimum position defilade may permit the best possible use of immediately available cover and concealment, i.e., in position defilade the machinegun and crew are shielded from enemy ground observation and direct fire by a terrain mask such as the crest of a hill. 105
- : know that the target is not visible to the gunner in position defilade; therefore, it is vital to use a tripod-mounted machinegun to permit adjusting fire through an observer. 106
- : know that the bipod-mounted machinegun is not suitable for the delivery of fire from minimum position defilade, but may be employed from partial position defilade. 107
- : know that a machinegun is in minimum position defilade when it is at the highest point on the reverse slope at which position defilade can be obtained and that maximum flexibility in engaging new targets from defilade is obtained with minimum position defilade. (The employment of more than minimum position defilade requires instruments not available to the IRSL.) 108
- : know the advantages of using minimum position defilade, i.e.: 109
- (1) The gun crew gains cover and concealment from aimed direct fire weapons and from enemy observers located forward of the mask and at an elevation below that of the machinegun position.
  - (2) The gun crew gains some freedom of movement at the gun position and at elevations below the gun position on the reverse slope, thus control and supply are facilitated.
  - (3) The characteristic smoke and flash of the machinegun are less likely to be detected and located by the enemy.

- : know the disadvantages of using minimum position defilade, i.e.: 110
- (1) The gunner cannot observe the target area and is totally dependent upon the observer to detect, locate, identify, and designate targets and to adjust the fire of the gun upon designated targets.
  - (2) Rapidly moving ground targets are difficult to engage because the adjustment of fire must be made through an observer.
  - (3) Targets located on the forward slope usually cannot be engaged because of the mask and the flatness of the trajectory, i.e., the cone of fire from the M60 machinegun does not rise above one meter at ranges to 600 meters and the majority of personnel targets usually will be detected, located, identified, and engaged in combat at ranges under 400 meters.
  - (4) It is usually impossible to obtain an effective final protective line.
- He must : know that a machinegun is in partial position defilade when it is at the lowest position on a reverse slope that will permit the gunner to see the target area and engage targets by direct laying. 111
- : know that partial position defilade gains useful cover and avoids all of the disadvantages of indirect laying, but recognize the danger of skylining the gun and crew and use camouflage against skylining. 112
- : recognize the advantage of holding a gun and crew in position defilade until required and moving it to a preselected partial position defilade just prior to firing, e.g., to gain surprise during offensive action. 113
- : use and supervise the use of partial position defilade to gain cover for the gun and crew when use of the technique will contribute to the delivery of effective fire and, simultaneously, make the best possible use of available cover and concealment. 114
- He will : recognize and designate specific locations that will provide useful minimum position defilade in relation to specific targets or target areas, e.g., useful minimum defilade may exist on the reverse (friendly) slope of a hill or ridge crest or, simply, in a ground fold. 115



- : to select a gun position in minimum defilade, move (e.g., crawl) up the slope until the target is in view while sighting at the height of the gunner's eyes; then move down the slope, sighting from the same height, until the target cannot be seen. 116
- : in each situation, weigh the advantages and disadvantages of using minimum position defilade as compared to employing direct laying and designate the position and technique of fire delivery most likely to accomplish the mission with minimum hazard to the crew and gun. 117
- He must : know that the essential elements required for the engagement of each target from minimum position defilade are mask clearance, direction, elevation, and adjustment of fire. 118
- : emplace the tripod-mounted gun in minimum position defilade and by observation ensure that the position of the tripod will permit full swinging traverse across the desired primary sector, i.e., lay the gun for direction on the center of the desired sector to avoid any later necessity to shift the tripod mount and thus nullify the recorded mask clearance(s). 119
- : establish mask clearance (minimum elevation) for the delivery of fire from minimum position defilade, i.e.: 120
- (1) If the mask (top of the crest) is 300 meters or less from the gun position, place a 300-meter range setting on the rear sight of the zeroed gun, lay on the top of the mask, and add three mils (clicks) of elevation with the elevating handwheel.
  - (2) If the mask is over 300 meters from the gun position, determine the range to the mask, place that range setting on the rear sight of the zeroed gun, lay on the top of the mask, and add three mils (clicks) of elevation with the elevating handwheel.
  - (3) Determine and record one minimum elevation for the entire sector of fire if possible, or if required by lateral variations in mask height, determine and record the minimum elevation for each target that must be engaged.

: lay the gun for direction on a specific target ,  
i.e.:

121

- (1) Place himself as an observer to the rear of the gun in prolongation of the gun-target line with the target in view and direct the gunner to shift the gun (not the mount) until the gun is alined on the target with correct mask clearance.
- (2) Select an easily identified terrain feature visible to the observer and to the gunner that is at a greater range than the target and at a higher elevation to serve as an aiming point for the gunner.
- (3) Determine the gun-target range, require this range to be set on the rear sight, and require the gunner to lay on the aiming point and record the range.
- (4) If the aiming point is on the gun-target line, the gun is alined for direction. Record the direction.
- (5) If the aiming point is not on the gun-target line, measure the horizontal distance in mils with the binocular from the aiming point to the target, announce the shift to the gunner (e.g., LEFT 14), and require the gunner to lay off the distance with the traversing handwheel to aline the gun on the target for direction and record the shift.

: lay the gun for elevation, i.e.:

122

- (1) Measure the vertical distance in mils with the binocular from the aiming point to the base of the target.
- (2) Direct the gunner to depress the gun the number of mils measured and thus lay the gun on the target. Record the elevation.

: adjust and control fire from the gun in position  
defilade, i.e.:

123

- (1) Require the gunner to systematically record the target number and data required to lay accurately on each target on the data section of the standard range card and to provide a copy of the completed card for the observer to permit rapid engagement of targets designated by number by the observer.

- (2) Observe tracer stream and bullet strike in relation to the target and use standard fire commands to call for and adjust fire while acting as observer.
- (3) Remain to the rear of the gun muzzle while acting as observer to avoid danger from ricochets if mask clearance is violated accidentally and to ensure adequate communication with the gunner through visual, touch, and sound signals.

: select an alternate gun position, preferably in partial defilade, that will permit coverage of the forward slope (as well as targets at longer ranges) by direct laying to ensure the engagement of all targets within effective range while using the best cover available in relation to the location of the targets demanding engagement. 124

He will : ensure through instruction, demonstration, and supervised performance that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) can select useful positions in minimum defilade or partial defilade, and deliver and control the delivery of effective fire from such positions. 125

: emphasize to his men that the use of minimum or partial defilade constitutes the best possible use of immediately available cover and concealment and thus permits the delivery of effective fire with the least possible exposure of the machinegun and crew to enemy located forward of and below the elevation of the gun position. 126

He must : anticipate enemy delivery of machinegun fire from position defilade or other concealed positions; determine the probable azimuth to the enemy gun by observing the beaten zone of the gun from a covered position, if practicable; localize the enemy gun as to range by using the "crack and thump" technique; and use searching mortar, artillery, or machinegun fire, as applicable and available, along the back azimuth of the enemy gun's direction of fire to destroy or neutralize the gun. 127

8. THE IRSL WILL, THROUGH INSTRUCTION, DEMONSTRATION, SUPERVISION, AND INSPECTION, ENSURE THE ADEQUATE MAINTENANCE OF THE M60 MACHINEGUN ORGANIC OR ATTACHED TO HIS SQUAD, INCLUDING PROTECTION FROM HARMFUL ENVIRONMENTS, DISASSEMBLY, CLEANING, PROCUREMENT AND REPLACEMENT OF VITAL PARTS, LUBRICATION, ASSEMBLY, AND PROCUREMENT AND MAINTENANCE OF AMMUNITION, ACCESSORIES, TOOLS, AND CLEANING MATERIALS.

He will : recognize and continually emphasize to his squad members and attached weapons crew members that all weapons in use under campaign conditions must be maintained according to need to ensure reliable functioning and to avoid unnecessary wear and deterioration; impress upon the weaponsmen that their survival and the accomplishment of the mission are directly dependent upon their ability to maintain their weapons and to deliver a superior volume of lethal fire during each contact with the enemy; and hold individual weaponsmen, weapons crew members, and any IFTL involved directly responsible for adequate weapons maintenance and full participation in the delivery of fire. 128

He must : recognize the tools and cleaning and lubrication materials required (issued) for maintenance of the M60 machinegun and identify any necessity that is missing; explain in detail and demonstrate their proper use for maintaining the M60 machinegun for any given climate (temperate, hot-wet, hot-dry, and extreme cold); require cleaning rags, patches, and brushes to be carried as additional aids to weapon maintenance; and ensure resupply of non-expendable and expendable items required for maintenance of the weapon and tripod mount. 129

: ensure through instruction, demonstration, supervised performance, and inspection that his IFTL's, machinegun crew members, and selected squad members can, without assistance or prompting: 130

- (1) Load, unload, and clear the weapon.
- (2) Systematically disassemble the weapon into the eight major groups and assemblies (general disassembly).
- (3) Systematically conduct a detailed disassembly of the major groups and assemblies within authorized limits (i.e., excepting the buffer assembly and the gun stock group); name and inspect the parts; and recognize or identify any broken, worn, or missing parts and replace them.

- (4) Thoroughly clean and properly lubricate the parts as required for effective functioning of the gun.
- (5) Systematically assemble the weapon and check it for functioning, including safety.
- (6) Thoroughly clean, properly lubricate, and check the functioning of the M122 tripod mount and its assemblies.
- (7) Mount the M60 machinegun correctly on the M122 tripod mount and use the traversing and elevating mechanism to control the delivery of effective fire.
- (8) Recognize 7.62mm, M60 machinegun ammunition by type marking (ball, tracer, armor piercing, armor piercing incendiary) and select the proper type for specific targets and firing missions.
- (9) Inspect, pack, transport, and maintain belted machinegun ammunition to ensure effective delivery of fire with minimum stoppages.

: conduct on-the-spot inspections of the organic or attached machinegun, ammunition, mounts, tools, accessories, and cleaning and preserving materials at random times with a frequency that will condition machinegun crew members to anticipate informal inspection of their weapon, ammunition, etc., at any time during contact with the IRSL. 131

: recognize that detailed disassembly and needless ("busy work") cleaning of weapons and accessories cause unnecessary wear and deformation of parts; require weapons to be disassembled and cleaned according to need; and require the gunner to make an immediate request for any parts or maintenance required of the unit armorer or higher echelon. 132

: habitually provide time for essential weapons maintenance as soon after prolonged use as is practicable, e.g., it is as sensible, and possibly more vital, to secure an area and call a halt for weapons maintenance after use and exposure to unfavorable conditions (such as a fire fight in a swamp) as it is to permit men to gain rest and consume food. 133

: coordinate weapons maintenance requiring disassembly when any threat of enemy contact exists so that a minimum number of weapons are disassembled (inoperative) at any given time, and ensure that adequate firepower is available to provide security. (This applies to all weapons, of course, not merely to machineguns.) 134

- : require essential maintenance before firing, i.e.: 135
- (1) Run a dry patch through the bores of both barrels to remove oil and ensure against obstruction.
  - (2) Check and tighten the gas port plug, gas cylinder extension, and the gas cylinder nut.
  - (3) Lightly oil or lubricate the bolt and receiver rails.
- : require lubrication of the moving parts during extended firing. 136
- : require barrel change at proper intervals, i.e.: 137
- (1) During sustained fire (100 rounds per minute), change barrel every 10 minutes.
  - (2) During rapid fire (200 rounds per minute), change barrel every two minutes.
  - (3) During cyclic fire (approximately 550 rounds per minute), change barrel every one minute.
- : require essential maintenance after firing, i.e.: 138
- (1) Remove powder residue and foulings from all parts.
  - (2) Swab the bores of both barrels with bore cleaner.
  - (3) Run the bore brush completely through each barrel several times.
  - (4) Run dry patches through the barrels until the patches come out clean.
  - (5) Lightly oil the bores and chambers. (If a need to fire is anticipated, as in a continuing operation, leave the bores and chambers dry.)
  - (6) Remove carbon from the face of the bolt and the bolt recess in the barrel socket.
  - (7) Disassemble and clean the gas system only if the gun operates sluggishly or if the piston fails to slide freely within the gas cylinder due to build-up of excessive carbon.



- (8) Properly lubricate moving parts and leave a light film of oil on all metal surfaces to prevent rust. (Excess oil in dusty areas will cause dust and sand to collect in working parts.)
- (9) When the gun is not being fired, repeat the after-firing maintenance procedure for two consecutive days or as required by exposure to harmful environments, i.e., rain, dust, etc.
- (10) When the gun is not being fired, repeat the after-firing maintenance procedure on a weekly basis or as required by exposure to harmful environments.

: prohibit the use of oil or dry-cleaning solvents on the following parts or surfaces for the reasons shown:

139

- (1) The buffer contains composite rubber pads which may break down if the buffer is oiled inside or immersed in dry-cleaning solvent. Lightly oil the exterior surface of the buffer.
- (2) Operation will be affected if oil or dry-cleaning solvent gets into the gas cylinder while cleaning the barrel. Hold the barrel with the gas cylinder in the upright position while cleaning.
- (3) The rubber covering on the stock and other parts of the gun may soften and break down if cleaned with unauthorized solvents.
- (4) Ammunition, if oiled, will corrode and collect dust and sand that will cause stoppages. Oil on cartridge cases may dangerously raise chamber pressure during firing.

: if CBR contamination is anticipated, apply oil to all outer metal surfaces of the machinegun and accessories. Do not oil ammunition. Keep the weapon, accessories, and ammunition covered as much as possible.

140

: require decontamination, cleaning, and lubrication of the weapon and mount after exposure to CBR in accordance with the type and degree of exposure.

141

He will : periodically, e.g., between major operations, arrange for a detailed technical inspection of his squad's weapons, including organic or attached machineguns, and ensure the replacement of parts or repairs as required by the unit armorer and/or an Ordnance technician.

142



- : periodically, e.g., prior to a major operation or immediately prior to a special operation, provide opportunity to test fire and check the zero of all weapons assigned to his men and to attached personnel. 143
- He must : particularly after exposure to mud (rice paddies, swamps) or snow during movement, warn his men to inspect weapons muzzles and flash suppressors to ensure against blocking with resultant overpressure that may cause injury to the firer and damage to the weapon. 144
- : know that the use of a thin plastic covering or covering with an olive drab handkerchief will prevent mud, snow, leaves, etc., from blocking muzzles and flash suppressors during movement; warn his men to ensure that such covers do not obscure front sights and thus interfere with the delivery of aimed fire. 145
- : consider the use of thin plastic sheeting to cover the machinegun receiver and bandoleer during windstorms in sandy areas and when being helicopter landed into sandy areas where rotor downwash fills the air with abrasive dust and sand; use rubber bands to hold the thin plastic sheeting in place; ensure that plastic covers can be ripped off quickly; and ensure that the weapon can be fired with the plastic sheeting in place in an emergency if a close, dangerous target is encountered. 146
- : specify the amounts and types of machinegun ammunition to be carried as a basic load in accordance with unit SOP or for a particular mission; know that a typical basic load is 900 rounds, i.e., the ammunition bearer, assistant gunner, and gunner each carry three 100-round bandoleers, including one bandoleer attached to the gun. 147
- : ensure an adequate supply of ammunition when a machinegun is manned by a skeleton crew by requiring other squad members to carry a 100-round belt per man, as necessary, during dismounted movement and require this ammunition to be collected and delivered to the machinegun upon occupation of a defensive position. 148

- : require machinegun crew members to report the amount of ammunition remaining to the nearest 100 rounds after each contact or as necessary to obtain resupply; redistribute ammunition when the situation permits to maintain a supply at each machinegun; and coordinate resupply through the platoon leader to ensure delivery of an adequate volume of fire. 149
  - : protect belted ammunition from mud, dust, etc., by use of bandoleers, ammunition boxes, or locally fabricated canvas sleeves. 150
  - : prohibit the carrying of exposed belts of ammunition draped on the shoulders where it will collect trash, mud, dust, etc., likely to cause stoppages and where sunlight reflected from brass cartridge cases will facilitate target detection by the enemy. 151
  - : require ammunition to be fired in essentially the same order in which it was issued to prevent corrosion, bending of rounds and links and other deterioration that may occur (and cause stoppages) when belted ammunition is man-transported for long periods of time under difficult terrain and weather conditions; turn in corroded or otherwise unserviceable ammunition for disposal; and seek habitually to maintain the prescribed basic load of clean, fresh ammunition. 152
  - : avoid bringing cold weapons from freezing outside air into heated bunkers, buildings, or tents where condensation will occur and cause moisture-covered mechanisms to freeze when again exposed to outside temperatures. 153
9. THE IRSL WILL RECOGNIZE AND CORRECT MALFUNCTIONS OCCURRING TO THE M60 MACHINEGUN; HE WILL APPLY IMMEDIATE ACTION TO REDUCE STOPPAGES DURING FIRING; AND WHEN IMMEDIATE ACTION FAILS TO REMEDY THE STOPPAGE HE WILL DETERMINE THE CAUSE AND REDUCE THE STOPPAGE.
- He will : know that a malfunction is a failure of the gun to function properly; and recognize sluggish operation and runaway gun as two of the more common malfunctions. 154
  - He must : recognize the sounds of a normally functioning M60 machinegun firing 6- to 9-round bursts at the standard rate of approximately 550 rounds per minute and detect sluggish operation as indicated by a significant reduction in speed of firing within each burst. 155

	: know that sluggish operation usually results from excessive friction caused by dirt, carbon, lack of proper lubrication, burred parts, or excessive loss of gas due to a loose or missing gas port plug.	156
	: if a sluggish gun is believed to be reasonably clean, check for a loose or missing gas port plug and tighten or replace the gas port plug, as necessary.	157
	: if the gas port plug is present and tight, clean and lubricate the gun, inspect thoroughly for burred parts, and replace parts as necessary; clean the inside of the gas system only after all other probable reasons for sluggishness have been eliminated.	158
He will	: recognize a <u>runaway gun</u> when the gun continues to fire after the trigger has been released.	159
	: hold the fire on the target until feeding is stopped or the ammunition is expended, e.g., in assault firing with the bandoleer attached to the gun, continue to move forward and keep the gun on the target(s) until the ammunition is expended.	160
	: stop a runaway gun or require the assistant gunner to stop the gun by:	161
	(1) Raising the cover to stop the feeding action.	
	(2) Twisting or breaking the belt to stop the feeding.	
	(3) Grasping the cocking handle firmly and pulling it to the rear to stop the bolt from going forward.	
	: correct the cause of a runaway gun, i.e., when the gun has stopped firing:	162
	(1) Check the gas system and ensure that the gas port plug, gas cylinder extension, and gas cylinder nut are tight to eliminate short recoil from loss of gas as the cause.	
	(2) Disassemble the gun and check the sear and sear notch to determine if wear on these parts is the cause. Replace parts as necessary.	
	(3) Clean the operating rod tube to eliminate excessive carbon build-up as a cause.	

- He must : know that a double feed occurs when a live round from the belt is fed into a chambered spent case, including a ruptured cartridge case lodged in the chamber, or into a chambered live round that failed to extract; and that the force of feeding may cause the detonation of a live round in an unlocked gun with possible injury to personnel and damage to the gun. 163
- : never retract the bolt and allow it to go forward if belted ammunition is on the feedtray and a live round, a ruptured cartridge case, or a spent round is lodged in the chamber or suspected of being lodged in the chamber. 164
- : know that a stoppage is any interruption in the cycle of functioning caused by faulty action of the gun or faulty ammunition and that stoppages are classified by their relationship to the cycle of functioning, i.e., failure of the gun to feed, chamber, fire, extract, eject, or cock. 165
- : know that immediate action is the action taken to reduce a stoppage without investigating the cause and that immediate action must be accomplished within 10 seconds, including waiting time, when the barrel is hot enough to cause a cook-off. 166
- : know that a cook-off occurs when the heat of the barrel transmitted through the case of a chambered cartridge causes the powder to ignite and fire the gun without the firing pin striking the primer, e.g., 200 rounds fired in a two-minute period may heat the barrel sufficiently to cause a cook-off. 167
- : know that a hangfire occurs when there is a slight delay between the time the firing pin strikes the primer of a cartridge and the time the weapon fires. Treat all misfires as hangfires. 168
- : know that a primary cause of stoppages is faulty ammunition and that the ejection of a faulty round and its replacement will reduce the majority of stoppages that are properly maintained. 169
- : recognize that a normal stoppage always occurs when the ammunition being fed into the gun is expended and anticipate the need to reload to maintain effective fire delivery. 170

: apply and complete immediate action within 10 seconds, including waiting time, when a stoppage occurs, i.e.:

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- (1) Wait five seconds before pulling the cocking handle to the rear as a guard against a hang-fire.
- (2) During the five-second wait, check visually or by feel during darkness to ensure that the ammunition is not expended and that the belt is free to feed, i.e., not twisted or fouled. If the ammunition has been expended, reload, relay on the target, and continue to deliver fire. (The occurrence of casualties may require the gunner to reload and deliver fire without an assistant gunner to feed the gun, particularly during an assault.)
- (3) After the five-second wait, pull the cocking handle to the rear, ensuring that the operating rod remains to the rear, and observe to determine if a round is ejected as the bolt is moved rearward.
- (4) If a round is ejected, return the cocking handle to the forward position, relay on the target, and attempt to fire. If the weapon does not fire, clear it and inspect the weapon and ammunition to determine and eliminate the cause of the stoppage.
- (5) If a round is not ejected, move the safety to the "S" (safe) position, return the cocking handle to the forward position, and raise the cover. Remove ammunition and links, then raise the cartridge tray to inspect the receiver and chamber.
- (6) If receiver and chamber are clear, reload, release the safety, relay on the target, and attempt to fire.
- (7) If a round is in the chamber, close the cover, move the safety to "F" (fire) position, and attempt to fire. If the weapon fires and ejects, reload, relay on the target, and continue to fire. If the round does not fire and the barrel is hot enough to cause a cook-off (200 rounds fired within two minutes), wait five minutes with the bolt in the forward position. Remove the round, reload, relay on the target, and continue to fire. (Disregard the five-minute wait if the barrel is not hot enough to cause a cook-off.)

(8) If a round is extracted, or when a round must be removed from the chamber, inspect the weapon and the round to determine the cause of the stoppage, e.g., lack of indentation on the primer may indicate a worn or broken firing pin or marks on the shoulders of the extracted round may indicate a ruptured cartridge case lodged in the chamber. (If a ruptured cartridge case is lodged in the barrel, change barrels immediately to put the gun back into action and require a crew member to remove the ruptured cartridge case from the barrel not in use.)

(9) Determine and eliminate the cause of the stoppage, reload, relay on the target, and continue to deliver fire.

: reduce the probability that a stoppage or malfunction will occur through regular and thorough maintenance; know the cycle of operation of the gun in relation to the prevention and elimination of stoppages and malfunctions; recognize the most likely cause of any stoppage or malfunction that can be reduced by the gunner; and systematically eliminate the most probable causes of any stoppage or malfunction to resume the delivery of effective fire with minimum loss of time. 172

: when operating as part of the platoon (as opposed to a semi-independent mission such as a squad ambush), promptly report a machinegun out of action when a stoppage or malfunction cannot be eliminated by the personnel at the gun with the tools and parts available, i.e., recognize that the loss of the supporting fire from a machinegun at squad level may have a significant effect on planning at platoon level. 173

: if any weapon has stoppages or malfunctions repeatedly without apparent cause, report the problem to the platoon leader and obtain repairs or a replacement. 174

: if an unusual number of stoppages or malfunctions occur with a specific lot of ammunition, request resupply from a different lot; identify and report the suspected lot by number (as shown on the containers); and replace the suspected ammunition that is in the hands of his squad members. 175

: seek habitually and deliberately to identify any causes of stoppages or malfunctions that appear to be peculiar to a specific environment and report the causes and remedies without delay. 176

He will : know that the application of immediate action is not instinctive, i.e., it is a learned skill; and deliberately condition his men to apply immediate action and reduce stoppages effectively under all conditions of visibility by forcing practice during all range and field firing. (Immediate action may be forced with some realism during training by loading dummy and blank rounds at random intervals in short belts loaded with live ammunition for practice firing.) 177

: ensure through instruction, demonstration, inspection, and supervised performance that his IFTL's, machinegun crew members, and selected squad members (potential machinegunners) know the cycle of operation of the machinegun in relation to the prevention and reduction of stoppages and malfunctions; that they seek to eliminate stoppages and malfunctions through regular and thorough maintenance of the machinegun, its accessories, and ammunition; and can effectively and systematically reduce stoppages and malfunctions under field conditions during all levels of visibility. 178

10. THE IRSL WILL ESTABLISH, DISSEMINATE, AND ENFORCE SAFETY PROCEDURES TO PREVENT ACCIDENTAL OR CARELESS DISCHARGE OF THE M60 MACHINEGUN.

He must : impress upon all members of his unit that the accidental discharge of the M60 machinegun is likely to result in a burst of fire that may: 179

- (1) Kill or seriously wound several fellow soldiers.
- (2) Damage or destroy valuable materiel, e.g., the accidental discharge of tracer rounds into a helicopter fuel cell.
- (3) Cause the loss of tactical surprise with resultant friendly casualties and possible mission failure, e.g., the premature disclosure of a friendly ambush site.

He will : habitually keep the machinegun unloaded and clear, i.e., with the chambers and feedtray empty, the bolt and cocking lever forward, and the safety on the SAFE position, at all times except when the gun is under the direct control of a trained gunner who is prepared to deliver fire on order or in reaction to the appearance of a target(s). 180



- : ensure that the machinegun is unloaded and cleared prior to cleaning, before storage when not in use, and prior to loading into a boat, vehicle, or aircraft for movement during which no need to deliver fire is anticipated. 181
- : when the gun is used for mechanical training, keep it unloaded and clear, with the bolt and cocking lever forward, the safety in the SAFE position, and the cover raised. 182
- : to ensure that the machinegun is clear upon completion of firing, unload and clear the gun and run a cleaning rod through the barrel until the end can be seen or felt (during darkness), then remove the cleaning rod. 183
- : keep the safety in the SAFE position at all times when the gun is loaded except when the deliberate intent is to move the safety to the FIRE position and deliver fire. 184
- : when a machinegun changes hands, require the man who takes over the gun to determine the safety status of the gun immediately upon taking it and to adhere to the safety precautions demanded by the specific situation while responsible for the gun, i.e., fix the responsibility for the adherence to safety measures directly upon the man in possession of the weapon to cover such diverse activities as relief during movement or on position, procurement from a vehicle, turn-in for temporary storage, etc. 185
- : keep the muzzles, bores, and chambers of both barrels clean and free of obstructions that might cause a double-feed or overpressure with resultant injury to personnel and damage to the gun. 186
- : indoctrinate all weaponsmen to focus attention upon and apply muzzle control, i.e., ensure that no weapon is ever pointed unknowingly or carelessly at anyone, and repeatedly emphasize the vital need to identify all targets with certainty prior to opening fire to avoid the mistaken delivery of lethal fire against friendly troops or friendly indigenous personnel. 187

- He must : recognize that bullets ricocheting from hard-surfaced roads, trees, buildings, barbed wire, or hard, frozen or rocky ground may strike friendly troops forward of a supporting machinegun and cause casualties; know the locations of friendly troops being supported; observe for any diversion from the prescribed route; maintain communication with supported troops to aid coordination of supporting machinegun fire when practical; and control machinegun fire accordingly to avoid causing friendly casualties. 188
- He will : issue specific orders in keeping with the situation as to when machineguns are to be carried loaded with the safety on the SAFE position; hold each gunner (i.e., the individual in possession of the gun) strictly responsible for the enforcement of orders pertinent to weapons safety; and treat each violation as a serious breach of discipline, i.e., as a threat to the safety and security of the unit members. 189
- He must : recognize that weapons safety practices are a part of combat discipline vital to the unhesitating delivery of effective fire; that the time required to load a machinegun may cost several friendly casualties; avoid extremes (e.g., requiring the gunner to risk any possibility of contact with an unloaded weapon); and patiently, persistently, and firmly condition all of his men to adhere to safe practices as a matter of ingrained habit. 190
11. THE IRSL WILL, ON ORDER OR AS DEMANDED BY THE SITUATION, DESTROY OR REQUIRE AND SUPERVISE THE DESTRUCTION OF THE M60 MACHINEGUN TO PREVENT CAPTURE.
- He will : warn his men that guerrillas habitually will seek to capture weapons for their own use and that the capture of a serviceable machinegun and ammunition by the enemy will result in increased friendly casualties, i.e., machineguns must be destroyed if necessary to prevent capture. 191
- He must : establish a priority for the destruction of machinegun components, i.e.:
- (1) Night-vision sights mounted upon or used with the machinegun.
  - (2) Operating group.
  - (3) Barrels.
- 192

- (4) Ammunition.
- (5) Tripod, including traversing and elevating mechanism.
- (6) Other components.

**He will :** use and supervise the use of the most practical and rapid means of destruction to prevent the enemy from salvaging parts that will permit the assembly of a serviceable machine, e.g.:

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- (1) Destroy the weapon by burning when time does not permit disassembly, i.e., raise the cover, place a thermate grenade on the receiver over the bolt, rest the cover on the grenade, and ignite the grenade by pulling the pin. (The AN-M14 incendiary grenade has an igniter-type fuze with a two-second delay element. It burns violently and will weld steel parts together when the molten metal flows between them. After releasing the safety lever, personnel must move immediately to a distance of not less than five meters from the grenade to avoid injury from the violent burning action which throws material in all directions.)
- (2) Disassemble as completely as time permits and use a barrel, heavy stone, etc., to smash the operating group, cover, feedtray, receiver group, buffer, stock, and gas cylinder.
- (3) Smash with gunfire or grenades.
- (4) Disperse and conceal disassembled parts by burying, submersion in deep water, mud, snow, etc., to prevent recovery.
- (5) When time and the situation permit, destroy ammunition by firing at the cyclic rate toward the enemy.
- (6) Smash or burn (with a thermate grenade) the traversing and elevating mechanism and platform group and bend the legs of the tripod and bipod.

- He must :** particularly on semi-independent missions, such as raids and ambushes, require the gunner to carry a thermate grenade to permit rapid destruction of the machinegun in the event capture is imminent. 194
- :** recognize that the occurrence of casualties may prevent machinegun crew members from destroying the machinegun, and ensure through instruction, limited demonstration, and simulated performance that all members of the squad can destroy the machinegun to prevent capture. 195